R E P O R T R E S U M E S

ED 020 313 VT 002 543

SOME TRAINING AND SERVICES NEEDED IN AGRICULTURE.
MISCELLANEOUS PUBLICATION NO. 966.
BY- CAMPBELL, PROCTOR
AGRICULTURAL RESEARCH SERVICE (DOA), WASH., D.C.
PUB DATE SEP 64
EDRS PRICE MF-$0.25 HC NOT AVAILABLE FROM EDRS. 15P.

DESCRIPTORS- *FARMERS, *AGRICULTURAL PRODUCTION, *EDUCATIONAL NEEDS, TECHNOLOGICAL ADVANCEMENT, *AGRICULTURAL TRENDS,

THERE WILL BE A CONTINUING AND INCREASING NEED FOR TECHNICAL TRAINING AND SERVICES DURING THE NEXT 10 TO 20 YEARS TO FULFILL FARMERS' REQUIREMENTS IN PRODUCING, HARVESTING, AND MARKETING AGRICULTURAL PRODUCTS AND FOR DEVELOPING AND OPERATING NONAGRICULTURAL ENTERPRISES BY FARMERS IN RURAL AREAS. THIS NEED IS APPARENT IN THE AREAS OF MANAGEMENT, LAND USE, FIELD CROPS, FOREST PRODUCTS, LIVESTOCK, POULTRY, HARVESTING, PROCESSING, AND MARKETING. TECHNOLOGICAL DEVELOPMENTS IN AGRICULTURE HAVE BROUGHT ABOUT UNPRECEDENTED CHANGES IN FARMS AND FARMING IN THE UNITED STATES DURING THE PAST TWO DECADES, AND CONTINUED CHANGES IN THE STRUCTURE OF FARMING AND IN HANDLING FARM PRODUCTS ARE INEVITABLE. THE APPLICATION OF PRESENT KNOWLEDGE AND NEW TECHNOLOGICAL DEVELOPMENTS WILL LEAD TO MORE SPECIALIZATION IN FARM OPERATIONS, MORE ACRES OPERATED PER FARM, LARGER ECONOMIC INPUTS, AND INCREASED MECHANIZATION. LAND AND LABOR INPUTS FOR AGRICULTURAL PRODUCTION WILL CONTINUE TO DECLINE. THE USE OF LAND FOR RECREATIONAL PURPOSES WILL CONTINUE TO GROW. AS THE FARM EVOLUTION CONTINUES, MANY YOUNG PEOPLE AND ADULTS MUST SEEK EMPLOYMENT OUTSIDE OF FARMING. FARMERS' TRAINING NEEDS WILL CHANGE MORE TO BASIC SCIENCE SUBJECTS, MANAGEMENT, AND MARKETING AS THE SHIFT CONTINUES TOWARD THE PURCHASE OF A HIGHER PERCENTAGE OF FARM PRODUCTION INPUTS. THE NEEDS FOR TRAINING WILL CONTINUE TO SHIFT AWAY FROM FARM TO BUSINESSES AND INDIVIDUALS THAT SUPPLY PRODUCTION INPUTS ON A FEE OR CONTRACTUAL BASIS. TRAINING AND SERVICES IN SOME AREAS WILL BECOME OBSOLETE WHILE NEEDS ARE DEVELOPING IN OTHER AREAS FOR NEW AND DIFFERENT TYPES OF TRAINING AND SERVICES. THE APPENDIXES LIST KINDS OF TRAINING AND SERVICES FARMERS WILL NEED IN 10 TO 20 YEARS. THIS DOCUMENT IS AVAILABLE AS A138--966 FOR 15 CENTS FROM SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20402. (WB)

Some Training and Services Needed In Agriculture

Miscellaneous Publication No. 966

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

PREFACE

The principal purpose of this report is to identify areas for which technical training and services will be needed by farmers during the next 10 to 20 years. The work was undertaken at the request of the Office of Rural Areas Development. The proposal for the work originated as a recommendation of the Industrial and Commercial Enterprise and Outdoor Recreation and Tourism Subcommittees of the National Public Advisory Committee on Rural Areas Development, U.S. Department of Agriculture. The Industrial and Commercial Enterprise subcommittee expressed the belief that the development of industrial and commercial enterprises in rural areas will be more effectively accomplished if more information is available as to the needs of farms today and in the future. The demand for services and technical training for farm operations could be a strong motive for bringing business and industry to rural communities. Training and services needed in farming for the years ahead are not identified with specific agricultural products or farm enterprises because many changes are anticipated in technology, consumer preferences, and land use, and because specific needs may be the same for several crops or enterprises. The kinds of training and services anticipated during the next 10 to 20 years are listed in the appendix of this report.

CONTENTS

Washington, D.C. Issued September 1964

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 — Price 15 cents

Some Training and Services Needed in Agriculture

By Proctor Campbell, *agricultural economist,*
Product and Process Evaluation Staff,
Agricultural Research Service

INTRODUCTION

This report defines the needs of U.S. farmers during the next 10 to 20 years, with special regard to technical training and types of services needed to meet changing farm production and commodity use patterns. Technological developments in agriculture have brought about unprecedented changes in farms and farming in the United States during the past two decades. The demand for more farm output during and following World War II, including the Korean conflict, together with shortages of labor and increased farm income in this period accelerated these changes. The size of farms increased and the number of farms and the farm population decreased. In recent years the price-cost squeeze has been an important factor in farm enlargement and farm mechanization and in the adoption of improved farm technology.

Farm production per man-hour increased 220 percent from 1940 to 1960, while total farm production increased by about 50 percent. Specialization became more important, and the number of enterprises per farm declined. There was a substantial shift in the source of farm inputs from farm labor to mechanical power and chemicals. During the period of 1950 to 1960 there was a substantial increase in fertilizer and farm machinery inputs and a decline in the use of labor and the acreage of cropland (fig. 1).

The technological developments also led to a decided growth in the means for supplying farmers with production needs and in facilities for marketing and processing farm products.

Continued changes in the structure of farming and in the marketing and processing of farm products are inevitable. Farmers will need more knowledge about more things and at the right time. The farm operator will not only have to keep up with and adjust to changes, but he

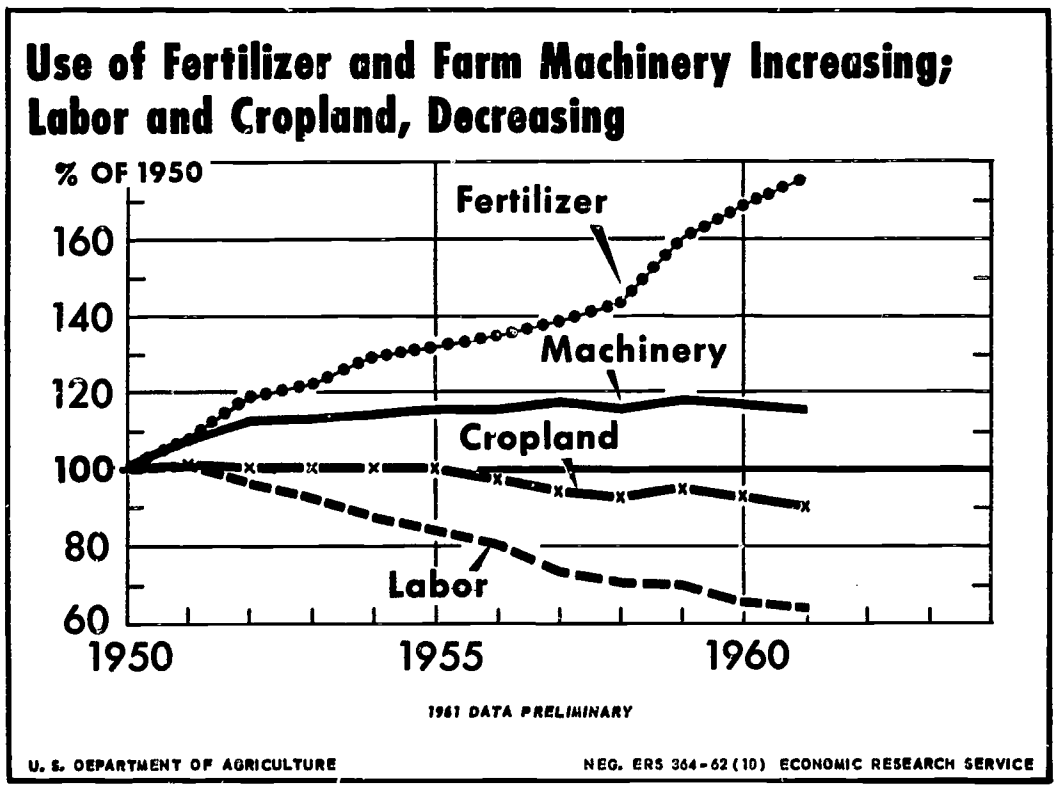

FIGURE 1.—Changes in the major farm inputs from 1950 to 1960.

will also have to anticipate changes and adjust to them. A broader education with emphasis on basic science subjects (see appendix) will provide a background for recognizing and understanding the longer range changes. Applied educational instruction can be expected to keep pace with the times.

COMMODITY USE AND PRODUCTION PATTERNS

Commodity use and production patterns will be influenced by changes in technology and the demand for farm products. Improved technology resulting in increases in crop yields significantly influences supply and production patterns. Commodity use patterns will be affected by changes in consumer income and diet, by shifts in population, and by the development of synthetic substitutes for farm products.

Changes in population and per capita income will directly affect the demand for agricultural commodities. U.S. population is projected to be 261 million in 1980, an increase of about 45 percent over that of 1960. Greater increases are expected in both total and per capita disposable personal income (table 1). Income projections are in terms of constant dollars and increases represent real gains in the output and consumption of goods and services.

TABLE 1.—*Index of population and disposable income in selected years, and projections for 1980*

[1960=100]

Item	1950	1954	1959	1960	1980
Population	84	90	98	100	145
Total disposable personal income [1]	73	80	97	100	225
Per capita disposable personal income [1]	86	89	99	100	155

[1] Deflated by Consumer Price Index.

Source: U.S. Department of Agriculture. *Land and Water Resources*—a policy guide. Land and Water Policy Committee. 1962.

Based on the 45-percent increase in population and an increase in per capita use of food, the domestic use of farm products in constant dollars is expected to rise by about 50 percent in 20 years. The increase in the per capita use of food will be the result of a further upgrading of the diet to include more meat and high-protein livestock products, rather than an increase in consumption of more pounds of food or calories. The decline in the per capita consumption of nonfood farm products is expected to continue but at a slower rate. However, the increase in population will cause the consumption of nonfood products in 1980 to be about 20 to 25 percent above that in 1959. Changes in consumption patterns of agricultural commodities for food and nonfood uses will be influenced by developments in utilization research. Real breakthroughs in technological developments for expanding nonfood uses would tend to limit the declining trend in per capita nonfood uses and could reverse the trend.

Foreign demand for U.S. agricultural products has been stimulated by Government efforts to facilitate exports at competitive prices. Additional increases in exports can be expected from more effective merchandising methods, cultivation of foreign markets, and accelerated Food for Peace and similar programs. The goal for exports in 1980 is estimated at 30 to 35 percent over 1960 exports.

The increase in domestic utilization of farm commodities and export requirements for 1980 will require an increase in farm output of 45 to 50 percent above that of 1959. Three major categories of gross production have been computed: Crop, pasture, and the product added by livestock (table 2).

If the high rate of increase in technological improvements and crop yields continues to increase at a rate equal to the trend of 1950–61, and with appropriate research, planning, and action, the increased

TABLE 2.—*Farm output in selected years and projected requirements for 1980*

[1947–49 dollars]

Item	1949	1954	1959	1980	Increase 1959 to 1980
	Million dollars	*Million dollars*	*Million dollars*	*Million dollars*	*Percent*
Farm output [1]	23,137	30,177	34,583	50,630	46
Total crop production	19,874	19,997	23,130	32,775	42
Pasture production [2]	1,750	2,035	2,028	2,870	41
Product added by livestock	7,876	8,930	9,984	15,510	55

[1] Farm output is exceeded by the total of crop production, pasture production, and the product added by livestock by an amount needed to produce the farm power of horses and mules and the seed for hay and pasture.

[2] Based on rough approximations of value and feed-equivalent units.

Source: U.S. Department of Agriculture. *Land and Water Resources*—a policy guide. Land and Water Policy Committee. 1962.

demands for agricultural products in the next 20 years can be met with about 50 million acres less of cropland than were available in 1959 (fig. 2).

FARMER NEEDS

Application of present knowledge and new technological developments will lead to more acres operated per farm, larger economic inputs, and increased mechanization. There will be a further reduction in labor inputs required in farming. Of the 3.7 million farms estimated in this country by the 1959 census, approximately 1.5 million had sales of over $5,000 and produced 87 percent of our food and fiber. All but about 150,000 of these 1.5 million farms are family farms. When we speak of needs for technical training and services for U.S. farmers during the next 10 to 20 years we are concerned primarily with these 1.5 million farms.

The increasing importance of management and marketing, the increased use of science on the farm, and the continued growth of agricultural technology including automation will influence technical training and services needed by farmers.

There will be further changes in the rural social structure. The farm businessman will operate more like any other businessman. With the further decline in farm labor inputs, the occupational status of farmworkers is expected to improve because the degree of skills required for

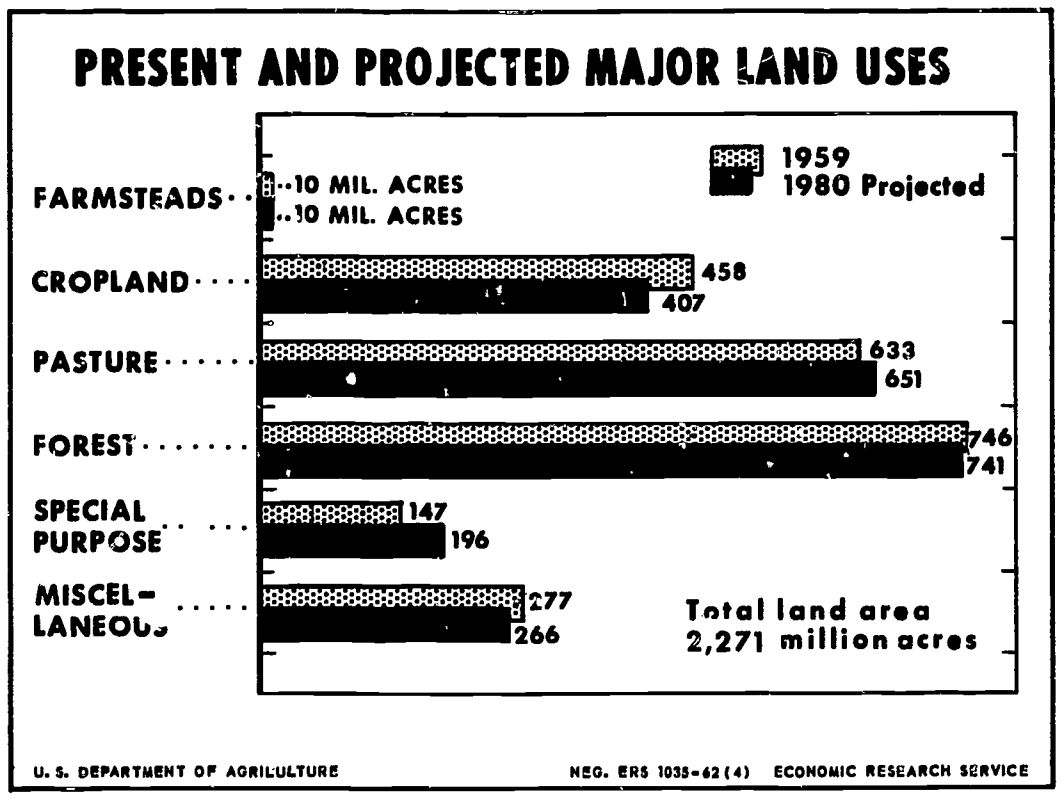

FIGURE 2.—The projected land use requirements needed to supply the estimated demand for agricultural products in 1980.

the reduced labor needs will command higher pay. Differences between rural living and urban living will narrow decidedly. The farm family will require more of the services demanded by families in the urban and metropolitan areas for everyday living.

More knowledge will be required in farm operations as changes occur in farm patterns, production techniques, processing requirements, and marketing methods. Training will be needed by farmers who perform many jobs on the farm and by educational leaders and research people who work with farmers; by persons who live off the farm but work on the farm as needed; and by persons engaged in agricultural occupations performed off the farm. In all cases the farm operator will need to know how to use the latest developments to best advantage.

Modern farming calls for ever increasing know-how and management ability on the part of the farmer. As farm management responsibilities become more complex, long-range planning of a farm's operation will be more imperative. More management services will be purchased to give the farmer more time for study and decisionmaking. Automation may play a big part in providing such services as recordkeeping, land use planning, developing feed formulas, and furnishing up-to-date marketing information.

Complex management responsibilities emphasize the need for farm operators to have a broad education (see appendix). Knowledge needed by the farm operator to effectively use the technical skills and services supplied by others may be obtained through short course meetings, seminars, literature, promotional activities of business firms, etc.

The appendix of this report is a tabulation of the types of training and services that may be needed by farmers. The specific training needs of services required will depend mostly on the kinds of farm enterprises and the scale of operations. Farmer cooperatives will supply much of the technical know-how and service needed in agriculture in the years ahead.

Areas in which there will be a need for technical training and services include land use, financial management, farm management, equipment operation and maintenance, use of chemicals, market demand, harvesting and preparation for market, processing and marketing. In each of these areas a part or all of the functional requirements may be supplied by the farm operator and other farm labor or they may be supplied as hired services by outside organizations or individuals. In either case, training will be needed to supply necessary knowledge and skills. In some cases the need will be for information, and in others it will be for application of knowledge and training.

Land use requirements of the future will demand continual planning and action programs by farmowners and by communities. There is a continuing need for services of technicians and for information on land capabilities, conservation needs and techniques, watershed planning and management, and use of private lands for outdoor recreation. Due to more leisure time, more spendable income, and increased mobility in the years ahead, the demand for outdoor recreation is expected to grow at a faster rate than the growth in population. Soil and water management are a vital part of land use. Services and technical training for surveying, terracing. stripcropping, methods of irrigation, conservation of water, and erosion control will continue to be needed for efficient farm operations.

By 1980, capitalization of farms will be higher than at present. More investment capital will be needed to finance the increased size of farms including the acquisition of additional land; the construction or purchase of up-to-date capital improvements such as buildings, irrigation systems, and fencing; and shifts in land use. Working capital of $100,000 or more to provide machinery, livestock, livestock feeds, and current supplies will be common. Although mechanization of major field crop operations was largely accomplished in the 1950's, there will be a continuing need for capital to replace obsolete equipment with equipment that is more efficient. Mechanization of livestock operations which

is just beginning will require large capital investments. As the needs for more capital develop, farmers will rely more and more on borrowed funds. They will borrow large sums when high returns can be expected.

In the next 10 to 20 years there will be a greater dependence on power farming—motor power and electric power— to make each farm unit more productive. Much of the power equipment will be farmer owned and may be operated by farm labor or by hired operators. There will be a continuing need for an adequate program to train young farmers and farm workers in the selection, operation, proper use, and maintenance of farm tools, machinery, and mechanical equipment. There will be a continuing need for farmers to keep advised of new types of equipment and for training in the use of the equipment. In some cases equipment will be rented for special jobs, and some jobs will be contracted. Types of jobs that may be contracted are terracing, land leveling, ditching, plowing, applying agricultural chemicals, and the harvesting of crops and forest products (see appendix).

Agricultural chemicals have become as necessary to farming as has mechanical equipment. The use of fertilizers to improve yields, of pesticides to control insects and diseases, and of herbicides to control weeds have all been major factors that contributed to the rapid growth per acre of farm production since World War II. Vitamins, hormones, antibiotics, coccidiostats, and other chemicals are used in the production of poultry and livestock. Even at present use levels of pesticides, the loss of potential crops and livestock due to insects, diseases, weeds, and rodents is high. Processors and distributors will also use more chemicals to make available the high-quality foods consumers desire. The release of new chemicals each year emphasizes the continual need for extensive testing of these materials and for educational and training programs to insure their safe and effective use.

The use and application of chemicals in crop and livestock production require expert knowledge for formulation and application. Some chemicals are used in minute quantities under varying circumstances, and others are used in large quantities and, like some insecticides, may be applied as a dust or spray over large areas by airplane. The need for the continual dissemination of technical information on the use of chemicals in crop, livestock, and forest production and the training of farmers and technicians in new procedures and methods of application are of prime importance. Stricter regulations governing the use of chemicals under existing or proposed State laws may be expected. It is possible that under such regulations the use of certain chemicals will be allowed only by or under the direction of a licensed technician.

The use of pest-control chemicals will continue to increase until research can provide other effective means of protecting our crops, forests, and livestock. The development of other effective means of protecting crops, forests, and livestock will open up new areas for which there will be a need for training and services. Until other methods of pest control are developed, emphasis should be on training the user to follow the directions and warnings on the registered labels of those pesticides presently available to him. The Federal Insecticide, Fungicide, and Rodenticide Act requires that all pesticides be properly labeled and registered with the USDA prior to shipment in interstate commerce. The labeling must bear warnings and cautions which are necessary and, if complied with, adequate to prevent injury to man, useful animals, and useful plants, as well as directions for use which will, when followed, result in effective pest control without leaving illegal residues on food or feed crops. Pesticides should be used only when needed and only in accordance with label warnings and directions.

Changes in market demand, in consumer market services, and in methods of processing and packaging for consumer acceptance will dictate changes in harvesting practices, farm processing, and methods of marketing. Characteristics and quality differences related to variety and locality of production will govern end-use and methods of processing to a greater extent in the future.

The trend toward producing for a particular market or for a particular kind of market demand will continue. Consumer demand for more built-in services will increase the necessity for specification buying at the farm level and will make it more important for farmers to produce and market the kind, quality, and uniformity of products wanted. To meet such changing conditions, farmers will need special training in market specifications, in farm processing and grading, and in the use of market news information. The services of expert market advisors will be in greater demand. (See appendix.)

Accomplishments of research on the utilization of agricultural commodities by industry and government will continue to affect the production and marketing of farm products. New uses for existing commodities, uses for new crops, better processing methods, new and different packaging methods, better storage, and improved distribution are developments that will influence farmer decisions in production (including variety of crop or breed of animal), harvesting, farm processing, and marketing.

Recent results of utilization research have contributed to the expansion or retention of markets for agricultural commodities, the establishment of new industries in rural and urban areas, and the increase of employ-

ment opportunities. They have also increased the variety, convenience, and utility of products available to consumers.

The development of processes for converting poultry feathers to feather meal for use in fertilizers, mixed feeds, and plastics is an example of how utilization research has made profitable markets for an agricultural byproduct formerly considered waste. These markets consume about 90,000 tons of feather meal annually.

Utilization research with potatoes has resulted in the marketing of new and improved dehydrated potatoes, frozen french fries, and other "convenience" potato products, which have been credited with arresting the decline in the per capita consumption of potatoes in this country.

The development of improved wash-wear finishes for cotton is among the outstanding accomplishments of utilization research. The apparel market held by cotton (in terms of raw cotton equivalent) is estimated to have increased from 56 percent in 1947 to 62 percent in 1961, largely because of the wash-wear development. Holding and expanding the market for cotton not only aids farmers, but it allows many cotton mills to provide employment to rural people.

As the farm evolution continues, many young people and adults must seek employment outside of farming. Many farm people are handicapped in obtaining nonfarm employment because of inadequate education and training. Better training will provide needed skills on the farm and will help farm people obtain employment off the farm. People should be educated both into and out of farming.

SUMMARY

There will be a continuing and increasing need for technical training and services during the next 10 to 20 years to fulfill farmers' requirements in producing, harvesting, and marketing agricultural products and for the development and operation of nonagricultural enterprises by farmers in rural areas. General categories in which this need is apparent are in management, land use, field crops, forest products, livestock, poultry, harvesting, processing, and marketing (see appendix).

Over the next two decades, land and labor inputs for agricultural production will continue to decline while inputs of machinery, agricultural chemicals, and many other capital using inputs will continue to increase. The use of land for recreational purposes will continue to grow. Numerous phases of producing, harvesting, and marketing farm products will become more specialized. These trends will increase the need for training farm operators and technicians in the latest changes and newest farming procedures. The service of educational leaders and research workers will be needed to bring up-to-date information to

farmers. A high degree of managerial competence will continue to be necessary for successful farm operations.

More specialization in farm operations, fewer enterprises per farm, and larger economic farm units will require more specialized training even though the number of skills required per farm may decline. While farm operators will need a broad education to better understand the technological and economic changes that occur, they will also need adequate training and knowledge for the type of farm enterprise being operated, even though the average farm operation is of substantial economic size and will become larger during the next two decades.

Farmers' training needs will change more to basic science subjects, management, and marketing as the shift continues toward the purchase of a higher percentage of farm production inputs. The needs for training will continue to shift away from the farm to businesses and individuals that supply production inputs on a fee or contractual basis. As changes occur in U.S. agriculture, training and services in some areas will become obsolete, while needs are developing in other areas for new and different types of training and services.

SELECTED REFERENCES

(1) DALY, REX F.
1961. AGRICULTURE IN THE 1960's: DEMAND SHIFTS AND TOMORROW'S FARMING. U.S. Dept. Agr., Econ. Res. Serv. U.S. Dept. Agr. Ann. Conf. for Ext. Workers, Univ. of Minnesota, St. Paul, Minn., Dec. 7, 1961. [Processed.]

(2) IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, CENTER OF AGRICULTURAL AND ECONOMIC ADJUSTMENT.
1961. IMPLICATIONS OF AGRICULTURAL ADJUSTMENTS FOR LAND GRANT COLLEGE ADMINISTRATORS. Seminar at Colorado State University, Fort Collins, Colo., June 25 to July 1, 1961. CAEA Report 8. Ames, Iowa.

(3) MEHREN, GEORGE L.
1962. THE TURNING OF A CENTURY. Giannini Foundation of Agriculture Economics, Univ. of California, Berkeley. 17 pp.

(4) OHIO AGRICULTURAL EXPERIMENT STATION.
1954. AGRICULTURAL RESEARCH AND EDUCATION BY 1970. Pub. Relat. Ser. 21. Wooster, Ohio.

(5) POPHAM, W. L.
1961. REGISTERING PESTICIDES AND INTERPRETING LABELS. U.S. Dept. Agr., Agr. Res. Serv. Meeting of Assoc. of Amer. Pesticide Control Off., Washington, D.C., Nov. 2, 1961. [Processed.]

(6) STEWART, H. L.
1962. CHANGES IN FARMS AND FARMING AND THEIR IMPACT ON THE FUTURE. U.S. Dept. Agr., Fed. Ext. Seminar Ser., Washington, D.C. Apr. 23, 1962. [Processed.]

(7) U.S. DEPARTMENT OF AGRICULTURE.
1962. LAND AND WATER RESOURCES—A POLICY GUIDE. Land and Water Policy Committee. 73 pp., illus.

(8) U.S. DEPARTMENT OF AGRICULTURE.
1962. JOINT COMMITTEE REPORT. Land Grant College meeting, April 1–2, 1962. 34 pp.

APPENDIX

The information in this section is provided as a quick reference to the kinds of training and services farmers will need in the next 10 to 20 years. These needs are tabulated according to five categories: management; land use; field crops; livestock and poultry; and harvesting, processing, and marketing. Training and service needs of farmers will be as follows:

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
MANAGEMENT:		
Principles of economics	Recordkeeping	Investment capital
Mathematics	Uses of capital for farming	Working capital
Principles of accounting	Business analysis	Loan analysis
Financial management	Long-range planning of farm operations	Bookkeeping
Business law	Organization of the farm	Economic outlook analysis
Principles of farmer cooperatives	Efficient use of labor	Specialists in farm management
Political science	Building requirements	Legal services
	Use of automation	
	Up-to-date production techniques	
	Agricultural policies and programs	
	Taxation	
LAND USE:		
General geology	Soil and moisture conservation	Irrigation
Soil science	Terrace construction	Soil analysis
Elementary surveying	Drainage	Soil surveys
Principles and practices of land use.	Irrigation	Land use surveying
Soil analysis	Flood and erosion control	Terracing and ditching
Land economics	Forest and woodland management	Zoning guides

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
FIELD CROPS:		
Biology	Up-to-date production techniques	Planning crop production inputs
Botany	Production of new crops	Pedigree seed
Entomology	Selecting, operating, and servicing farm machinery and equipment	Shops to repair machinery
General chemistry	Applying and using fertilizers and pesticides	Trained operators of farm equipment
Plant breeding	Limitations and dangers of pesticides	Rental of special equipment
Plant nutrition		Soil testing to determine fertilizer need
		Technical information on use of farm chemicals
		Large-scale application of fertilizers and pesticides
LIVESTOCK AND POULTRY:		
Biology	Up-to-date production techniques	Planning production inputs
Entomology	Breed selection	Breeding
Animal husbandry	Selecting, operating, and servicing machinery and equipment	Development of balanced feed formulas for livestock and poultry
Animal nutrition	Application and use of pesticides	Shops to repair machinery
General chemistry	Limitations and dangers of pesticides	Trained operators of farm equipment
	Chemical additives feed formulas	Rental of special equipment
		Technical information on use of farm chemicals
		Large-scale application of fertilizers and pesticides

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
HARVESTING, PROCESSING, AND MARKETING:		
Principles of marketing	Up-to-date harvesting requirements and techniques	Contract harvesting
Agriculture prices	Market specifications	Dissemination of market information.
Consumer prices	Grades and grading	Market advisors
Foreign trade	Processing on the farm	Contract marketing
	Packaging and storing	Grading
	Understanding market demand	Packaging
	Using market information	Processing
		Storing

ACKNOWLEDGMENTS

Appreciation is expressed to the following persons for reviewing this report and for their helpful suggestions and comments: In the U.S. Department of Agriculture, John M. Brewster, agricultural economist, Farm Production Economics Division, Economic Research Service; C. B. Gilliland, assistant director, Rural Areas Development; John R. Matchett, director, Product and Process Evaluation Staff, Agricultural Research Service; E. G. McKibben, director, Agricultural Engineering Research Division, Agricultural Research Service; Robert O. Rogers, assistant director, Product and Process Evaluation Staff, Agricultural Research Service; Raymond C. Scott, assistant administrator, Federal Extension Service; John H. Southern, economist, Resource Development Economics Division, Economic Research Service; and in the U.S. Department of Health, Education, and Welfare, A. W. Tenney, director, Agricultural Education Division, Office of Education.

U.S. GOVERNMENT PRINTING OFFICE: 1964 O—732-373

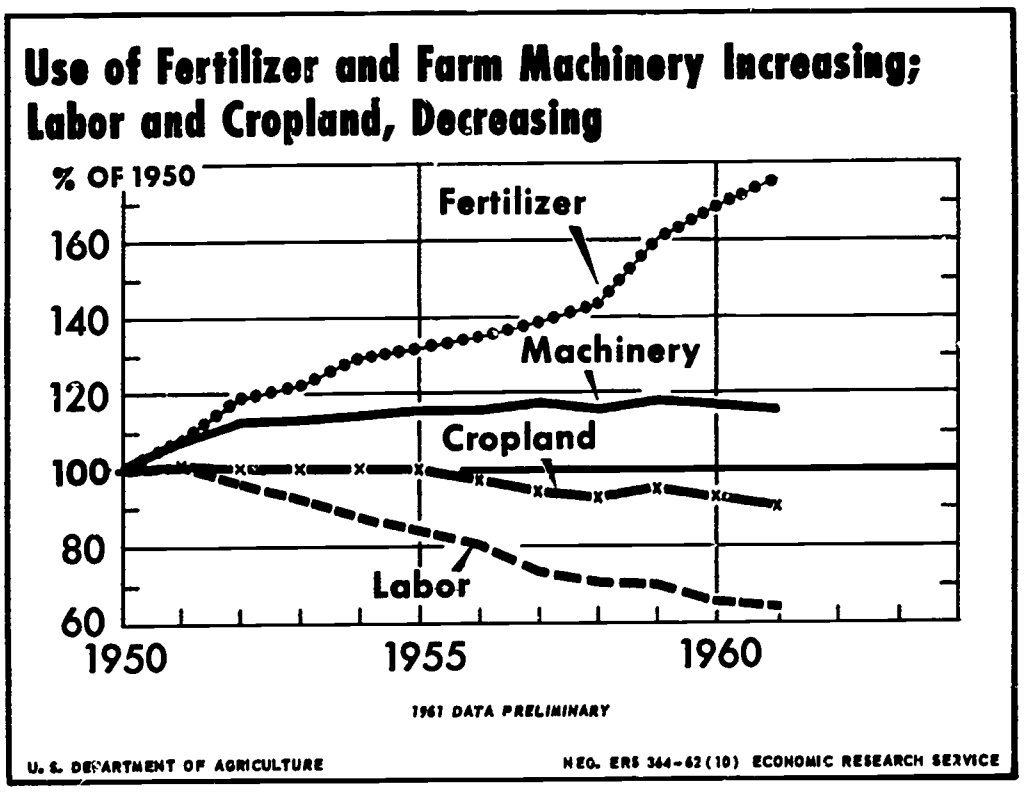

FIGURE 1.—Changes in the major farm inputs from 1950 to 1960.

will also have to anticipate changes and adjust to them. A broader education with emphasis on basic science subjects (see appendix) will provide a background for recognizing and understanding the longer range changes. Applied educational instruction can be expected to keep pace with the times.

COMMODITY USE AND PRODUCTION PATTERNS

Commodity use and production patterns will be influenced by changes in technology and the demand for farm products. Improved technology resulting in increases in crop yields significantly influences supply and production patterns. Commodity use patterns will be affected by changes in consumer income and diet, by shifts in population, and by the development of synthetic substitutes for farm products.

Changes in population and per capita income will directly affect the demand for agricultural commodities. U.S. population is projected to be 261 million in 1980, an increase of about 45 percent over that of 1960. Greater increases are expected in both total and per capita disposable personal income (table 1). Income projections are in terms of constant dollars and increases represent real gains in the output and consumption of goods and services.

TABLE 1.—*Index of population and disposable income in selected years, and projections for 1980*

[1960=100]

Item	1950	1954	1959	1960	1980
Population	84	90	98	100	145
Total disposable personal income [1]	73	80	97	100	225
Per capita disposable personal income [1]	86	89	99	100	155

[1] Deflated by Consumer Price Index.

Source: U.S. Department of Agriculture. *Land and Water Resources*—a policy guide. Land and Water Policy Committee. 1962.

Based on the 45-percent increase in population and an increase in per capita use of food, the domestic use of farm products in constant dollars is expected to rise by about 50 percent in 20 years. The increase in the per capita use of food will be the result of a further upgrading of the diet to include more meat and high-protein livestock products, rather than an increase in consumption of more pounds of food or calories. The decline in the per capita consumption of nonfood farm products is expected to continue but at a slower rate. However, the increase in population will cause the consumption of nonfood products in 1980 to be about 20 to 25 percent above that in 1959. Changes in consumption patterns of agricultural commodities for food and nonfood uses will be influenced by developments in utilization research. Real breakthroughs in technological developments for expanding nonfood uses would tend to limit the declining trend in per capita nonfood uses and could reverse the trend.

Foreign demand for U.S. agricultural products has been stimulated by Government efforts to facilitate exports at competitive prices. Additional increases in exports can be expected from more effective merchandising methods, cultivation of foreign markets, and accelerated Food for Peace and similar programs. The goal for exports in 1980 is estimated at 30 to 35 percent over 1960 exports.

The increase in domestic utilization of farm commodities and export requirements for 1980 will require an increase in farm output of 45 to 50 percent above that of 1959. Three major categories of gross production have been computed: Crop, pasture, and the product added by livestock (table 2).

If the high rate of increase in technological improvements and crop yields continues to increase at a rate equal to the trend of 1950–61, and with appropriate research, planning, and action, the increased

TABLE 2.—*Farm output in selected years and projected requirements for 1980*

[1947–49 dollars]

Item	1949	1954	1959	1980	Increase 1959 to 1980
	Million dollars	*Million dollars*	*Million dollars*	*Million dollars*	*Percent*
Farm output [1]	23,137	30,177	34,583	50,630	46
Total crop production	19,874	19,997	23,130	32,775	42
Pasture production [2]	1,750	2,035	2,028	2,870	41
Product added by livestock	7,876	8,930	9,984	15,510	55

[1] Farm output is exceeded by the total of crop production, pasture production, and the product added by livestock by an amount needed to produce the farm power of horses and mules and the seed for hay and pasture.

[2] Based on rough approximations of value and feed-equivalent units.

Source: U.S. Department of Agriculture. *Land and Water Resources*—a policy guide. Land and Water Policy Committee. 1962.

demands for agricultural products in the next 20 years can be met with about 50 million acres less of cropland than were available in 1959 (fig. 2).

FARMER NEEDS

Application of present knowledge and new technological developments will lead to more acres operated per farm, larger economic inputs, and increased mechanization. There will be a further reduction in labor inputs required in farming. Of the 3.7 million farms estimated in this country by the 1959 census, approximately 1.5 million had sales of over $5,000 and produced 87 percent of our food and fiber. All but about 150,000 of these 1.5 million farms are family farms. When we speak of needs for technical training and services for U.S. farmers during the next 10 to 20 years we are concerned primarily with these 1.5 million farms.

The increasing importance of management and marketing, the increased use of science on the farm, and the continued growth of agricultural technology including automation will influence technical training and services needed by farmers.

There will be further changes in the rural social structure. The farm businessman will operate more like any other businessman. With the further decline in farm labor inputs, the occupational status of farmworkers is expected to improve because the degree of skills required for

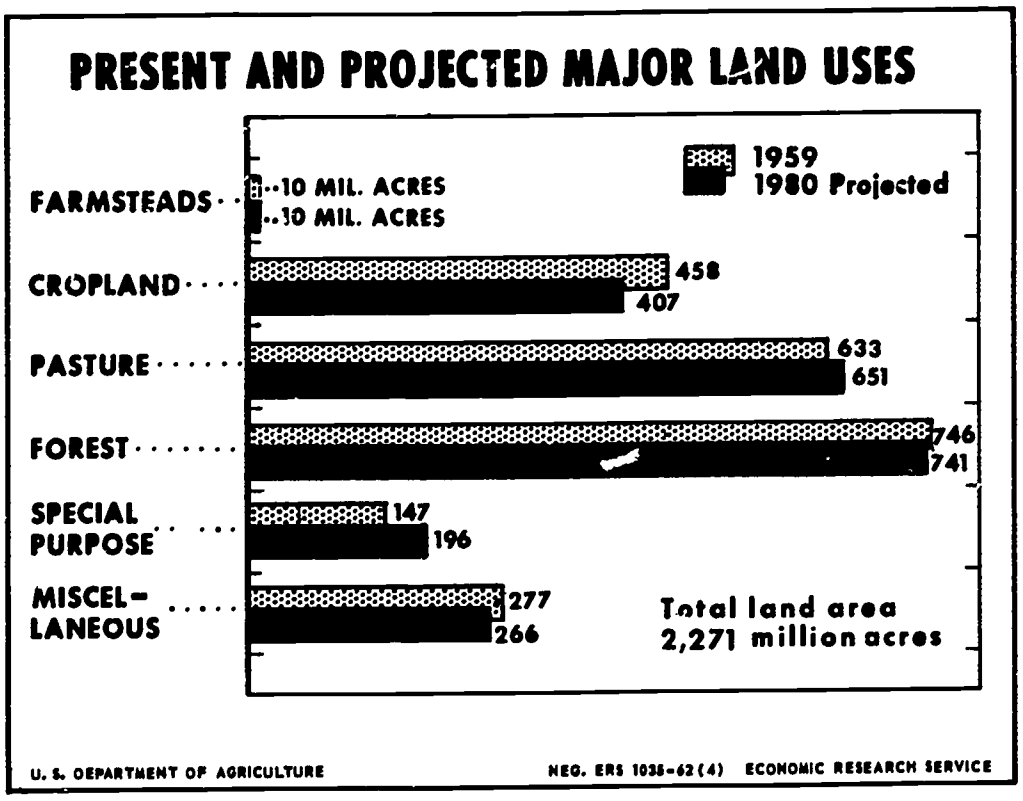

FIGURE 2.—The projected land use requirements needed to supply the estimated demand for agricultural products in 1980.

the reduced labor needs will command higher pay. Differences between rural living and urban living will narrow decidedly. The farm family will require more of the services demanded by families in the urban and metropolitan areas for everyday living.

More knowledge will be required in farm operations as changes occur in farm patterns, production techniques, processing requirements, and marketing methods. Training will be needed by farmers who perform many jobs on the farm and by educational leaders and research people who work with farmers; by persons who live off the farm but work on the farm as needed; and by persons engaged in agricultural occupations performed off the farm. In all cases the farm operator will need to know how to use the latest developments to best advantage.

Modern farming calls for ever increasing know-how and management ability on the part of the farmer. As farm management responsibilities become more complex, long-range planning of a farm's operation will be more imperative. More management services will be purchased to give the farmer more time for study and decisionmaking. Automation may play a big part in providing such services as recordkeeping, land use planning, developing feed formulas, and furnishing up-to-date marketing information.

Complex management responsibilities emphasize the need for farm operators to have a broad education (see appendix). Knowledge needed by the farm operator to effectively use the technical skills and services supplied by others may be obtained through short course meetings, seminars, literature, promotional activities of business firms, etc.

The appendix of this report is a tabulation of the types of training and services that may be needed by farmers. The specific training needs of services required will depend mostly on the kinds of farm enterprises and the scale of operations. Farmer cooperatives will supply much of the technical know-how and service needed in agriculture in the years ahead.

Areas in which there will be a need for technical training and services include land use, financial management, farm management, equipment operation and maintenance, use of chemicals, market demand, harvesting and preparation for market, processing and marketing. In each of these areas a part or all of the functional requirements may be supplied by the farm operator and other farm labor or they may be supplied as hired services by outside organizations or individuals. In either case, training will be needed to supply necessary knowledge and skills. In some cases the need will be for information, and in others it will be for application of knowledge and training.

Land use requirements of the future will demand continual planning and action programs by farmowners and by communities. There is a continuing need for services of technicians and for information on land capabilities, conservation needs and techniques, watershed planning and management, and use of private lands for outdoor recreation. Due to more leisure time, more spendable income, and increased mobility in the years ahead, the demand for outdoor recreation is expected to grow at a faster rate than the growth in population. Soil and water management are a vital part of land use. Services and technical training for surveying, terracing, stripcropping, methods of irrigation, conservation of water, and erosion control will continue to be needed for efficient farm operations.

By 1980, capitalization of farms will be higher than at present. More investment capital will be needed to finance the increased size of farms including the acquisition of additional land; the construction or purchase of up-to-date capital improvements such as buildings, irrigation systems, and fencing; and shifts in land use. Working capital of $100,000 or more to provide machinery, livestock, livestock feeds, and current supplies will be common. Although mechanization of major field crop operations was largely accomplished in the 1950's, there will be a continuing need for capital to replace obsolete equipment with equipment that is more efficient. Mechanization of livestock operations which

is just beginning will require large capital investments. As the needs for more capital develop, farmers will rely more and more on borrowed funds. They will borrow large sums when high returns can be expected.

In the next 10 to 20 years there will be a greater dependence on power farming—motor power and electric power— to make each farm unit more productive. Much of the power equipment will be farmer owned and may be operated by farm labor or by hired operators. There will be a continuing need for an adequate program to train young farmers and farm workers in the selection, operation, proper use, and maintenance of farm tools, machinery, and mechanical equipment. There will be a continuing need for farmers to keep advised of new types of equipment and for training in the use of the equipment. In some cases equipment will be rented for special jobs, and some jobs will be contracted. Types of jobs that may be contracted are terracing, land leveling, ditching, plowing, applying agricultural chemicals, and the harvesting of crops and forest products (see appendix).

Agricultural chemicals have become as necessary to farming as has mechanical equipment. The use of fertilizers to improve yields, of pesticides to control insects and diseases, and of herbicides to control weeds have all been major factors that contributed to the rapid growth per acre of farm production since World War II. Vitamins, hormones, antibiotics, coccidiostats, and other chemicals are used in the production of poultry and livestock. Even at present use levels of pesticides, the loss of potential crops and livestock due to insects, diseases, weeds, and rodents is high. Processors and distributors will also use more chemicals to make available the high-quality foods consumers desire. The release of new chemicals each year emphasizes the continual need for extensive testing of these materials and for educational and training programs to insure their safe and effective use.

The use and application of chemicals in crop and livestock production require expert knowledge for formulation and application. Some chemicals are used in minute quantities under varying circumstances, and others are used in large quantities and, like some insecticides, may be applied as a dust or spray over large areas by airplane. The need for the continual dissemination of technical information on the use of chemicals in crop, livestock, and forest production and the training of farmers and technicians in new procedures and methods of application are of prime importance. Stricter regulations governing the use of chemicals under existing or proposed State laws may be expected. It is possible that under such regulations the use of certain chemicals will be allowed only by or under the direction of a licensed technician.

The use of pest-control chemicals will continue to increase until research can provide other effective means of protecting our crops, forests, and livestock. The development of other effective means of protecting crops, forests, and livestock will open up new areas for which there will be a need for training and services. Until other methods of pest control are developed, emphasis should be on training the user to follow the directions and warnings on the registered labels of those pesticides presently available to him. The Federal Insecticide, Fungicide, and Rodenticide Act requires that all pesticides be properly labeled and registered with the USDA prior to shipment in interstate commerce. The labeling must bear warnings and cautions which are necessary and, if complied with, adequate to prevent injury to man, useful animals, and useful plants, as well as directions for use which will, when followed, result in effective pest control without leaving illegal residues on food or feed crops. Pesticides should be used only when needed and only in accordance with label warnings and directions.

Changes in market demand, in consumer market services, and in methods of processing and packaging for consumer acceptance will dictate changes in harvesting practices, farm processing, and methods of marketing. Characteristics and quality differences related to variety and locality of production will govern end-use and methods of processing to a greater extent in the future.

The trend toward producing for a particular market or for a particular kind of market demand will continue. Consumer demand for more built-in services will increase the necessity for specification buying at the farm level and will make it more important for farmers to produce and market the kind, quality, and uniformity of products wanted. To meet such changing conditions, farmers will need special training in market specifications, in farm processing and grading, and in the use of market news information. The services of expert market advisors will be in greater demand. (See appendix.)

Accomplishments of research on the utilization of agricultural commodities by industry and government will continue to affect the production and marketing of farm products. New uses for existing commodities, uses for new crops, better processing methods, new and different packaging methods, better storage, and improved distribution are developments that will influence farmer decisions in production (including variety of crop or breed of animal), harvesting, farm processing, and marketing.

Recent results of utilization research have contributed to the expansion or retention of markets for agricultural commodities, the establishment of new industries in rural and urban areas, and the increase of employ-

ment opportunities. They have also increased the variety, convenience, and utility of products available to consumers.

The development of processes for converting poultry feathers to feather meal for use in fertilizers, mixed feeds, and plastics is an example of how utilization research has made profitable markets for an agricultural byproduct formerly considered waste. These markets consume about 90,000 tons of feather meal annually.

Utilization research with potatoes has resulted in the marketing of new and improved dehydrated potatoes, frozen french fries, and other "convenience" potato products, which have been credited with arresting the decline in the per capita consumption of potatoes in this country.

The development of improved wash-wear finishes for cotton is among the outstanding accomplishments of utilization research. The apparel market held by cotton (in terms of raw cotton equivalent) is estimated to have increased from 56 percent in 1947 to 62 percent in 1961, largely because of the wash-wear development. Holding and expanding the market for cotton not only aids farmers, but it allows many cotton mills to provide employment to rural people.

As the farm evolution continues, many young people and adults must seek employment outside of farming. Many farm people are handicapped in obtaining nonfarm employment because of inadequate education and training. Better training will provide needed skills on the farm and will help farm people obtain employment off the farm. People should be educated both into and out of farming.

SUMMARY

There will be a continuing and increasing need for technical training and services during the next 10 to 20 years to fulfill farmers' requirements in producing, harvesting, and marketing agricultural products and for the development and operation of nonagricultural enterprises by farmers in rural areas. General categories in which this need is apparent are in management, land use, field crops, forest products, livestock, poultry, harvesting, processing, and marketing (see appendix).

Over the next two decades, land and labor inputs for agricultural production will continue to decline while inputs of machinery, agricultural chemicals, and many other capital using inputs will continue to increase. The use of land for recreational purposes will continue to grow. Numerous phases of producing, harvesting, and marketing farm products will become more specialized. These trends will increase the need for training farm operators and technicians in the latest changes and newest farming procedures. The service of educational leaders and research workers will be needed to bring up-to-date information to

farmers. A high degree of managerial competence will continue to be necessary for successful farm operations.

More specialization in farm operations, fewer enterprises per farm, and larger economic farm units will require more specialized training even though the number of skills required per farm may decline. While farm operators will need a broad education to better understand the technological and economic changes that occur, they will also need adequate training and knowledge for the type of farm enterprise being operated, even though the average farm operation is of substantial economic size and will become larger during the next two decades.

Farmers' training needs will change more to basic science subjects, management, and marketing as the shift continues toward the purchase of a higher percentage of farm production inputs. The needs for training will continue to shift away from the farm to businesses and individuals that supply production inputs on a fee or contractual basis. As changes occur in U.S. agriculture, training and services in some areas will become obsolete, while needs are developing in other areas for new and different types of training and services.

SELECTED REFERENCES

(1) DALY, REX F.
1961. AGRICULTURE IN THE 1960'S: DEMAND SHIFTS AND TOMORROW'S FARMING. U.S. Dept. Agr., Econ. Res. Serv. U.S. Dept. Agr. Ann. Conf. for Ext. Workers, Univ. of Minnesota, St. Paul, Minn., Dec. 7, 1961. [Processed.]

(2) IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY, CENTER OF AGRICULTURAL AND ECONOMIC ADJUSTMENT.
1961. IMPLICATIONS OF AGRICULTURAL ADJUSTMENTS FOR LAND GRANT COLLEGE ADMINISTRATORS. Seminar at Colorado State University, Fort Collins, Colo., June 25 to July 1, 1961. CAEA Report 8. Ames, Iowa.

(3) MEHREN, GEORGE L.
1962. THE TURNING OF A CENTURY. Giannini Foundation of Agriculture Economics, Univ. of California, Berkeley. 17 pp.

(4) OHIO AGRICULTURAL EXPERIMENT STATION.
1954. AGRICULTURAL RESEARCH AND EDUCATION BY 1970. Pub. Relat. Ser. 21. Wooster, Ohio.

(5) POPHAM, W. L.
1961. REGISTERING PESTICIDES AND INTERPRETING LABELS. U.S. Dept. Agr., Agr. Res. Serv. Meeting of Assoc. of Amer. Pesticide Control Off., Washington, D.C., Nov. 2, 1961. [Processed.]

(6) STEWART, H. L.
1962. CHANGES IN FARMS AND FARMING AND THEIR IMPACT ON THE FUTURE. U.S. Dept. Agr., Fed. Ext. Seminar Ser., Washington, D.C. Apr. 23, 1962. [Processed.]

(7) U.S. DEPARTMENT OF AGRICULTURE.
1962. LAND AND WATER RESOURCES—A POLICY GUIDE. Land and Water Policy Committee. 73 pp., illus.

(8) U.S. DEPARTMENT OF AGRICULTURE.
1962. JOINT COMMITTEE REPORT. Land Grant College meeting, April 1–2, 1962. 34 pp.

APPENDIX

The information in this section is provided as a quick reference to the kinds of training and services farmers will need in the next 10 to 20 years. These needs are tabulated according to five categories: management; land use; field crops; livestock and poultry; and harvesting, processing, and marketing. Training and service needs of farmers will be as follows:

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
MANAGEMENT:		
Principles of economics	Recordkeeping	Investment capital
Mathematics	Uses of capital for farming	Working capital
Principles of accounting	Business analysis	Loan analysis
Financial management	Long-range planning of farm operations	Bookkeeping
Business law	Organization of the farm	Economic outlook analysis
Principles of farmer cooperatives	Efficient use of labor	Specialists in farm management
Political science	Building requirements	Legal services
	Use of automation	
	Up-to-date production techniques	
	Agricultural policies and programs	
	Taxation	
LAND USE:		
General geology	Soil and moisture conservation	Irrigation
Soil science	Terrace construction	Soil analysis
Elementary surveying	Drainage	Soil surveys
Principles and practices of land use.	Irrigation	Land use surveying
Soil analysis	Flood and erosion control	Terracing and ditching
Land economics	Forest and woodland management	Zoning guides

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
FIELD CROPS:		
Biology	Up-to-date production techniques	Planning crop production inputs
Botany	Production of new crops	Pedigree seed
Entomology	Selecting, operating, and servicing farm machinery and equipment	Shops to repair machinery
General chemistry	Applying and using fertilizers and pesticides	Trained operators of farm equipment
Plant breeding	Limitations and dangers of pesticides	Rental of special equipment
Plant nutrition		Soil testing to determine fertilizer need
		Technical information on use of farm chemicals
		Large-scale application of fertilizers and pesticides
LIVESTOCK AND POULTRY:		
Biology	Up-to-date production techniques	Planning production inputs
Entomology	Breed selection	Breeding
Animal husbandry	Selecting, operating, and servicing machinery and equipment	Development of balanced feed formulas for livestock and poultry
Animal nutrition	Application and use of pesticides	Shops to repair machinery
General chemistry	Limitations and dangers of pesticides	Trained operators of farm equipment
	Chemical additives feed formulas	Rental of special equipment
		Technical information on use of farm chemicals
		Large-scale application of fertilizers and pesticides

Basic training needed in—	*Special training needed in—*	*Farm services needed—*
HARVESTING, PROCESSING, AND MARKETING:		
Principles of marketing	Up-to-date harvesting requirements and techniques	Contract harvesting
Agriculture prices	Market specifications	Dissemination of market information.
Consumer prices	Grades and grading	Market advisors
Foreign trade	Processing on the farm	Contract marketing
	Packaging and storing	Grading
	Understanding market demand	Packaging
	Using market information	Processing
		Storing

ACKNOWLEDGMENTS

Appreciation is expressed to the following persons for reviewing this report and for their helpful suggestions and comments: In the U.S. Department of Agriculture, John M. Brewster, agricultural economist, Farm Production Economics Division, Economic Research Service; C. B. Gilliland, assistant director, Rural Areas Development; John R. Matchett, director, Product and Process Evaluation Staff, Agricultural Research Service; E. G. McKibben, director, Agricultural Engineering Research Division, Agricultural Research Service; Robert O. Rogers, assistant director, Product and Process Evaluation Staff, Agricultural Research Service; Raymond C. Scott, assistant administrator, Federal Extension Service; John H. Southern, economist, Resource Development Economics Division, Economic Research Service; and in the U.S. Department of Health, Education, and Welfare, A. W. Tenney, director, Agricultural Education Division, Office of Education.

U.S. GOVERNMENT PRINTING OFFICE: 1964 O—732-373